REMARKS

The present amendment is submitted herewith to amend the specification. The changes to the specification are mostly editorial in nature. The changes to the specification made in the Substitute Specification are:

1. The specification is amended throughout to correct the loss of formatting of certain characters; many superscripts and subscripts were dropped from the text during preparation of the specification filed for the present application.

2. Paragraph numbers following paragraph 13 are changed to be one (1) less than in the specification as filed. This corrects a spurious line return.

3. A typographical error in the heading "DETAILED DESCRIPTION OF THE INVENTION" is corrected.

4. Paragraph 13 (previously 14) is amended as follows:

In a preferred embodiment of the present invention, a group of $In_xGa_{1-x}N/In_yGa_{1-y}N$ single quantum wells (SQWs) were grown by MOCVD on (0001) sapphire substrates. MOCVD was performed using trimethyl gallium (TMGa), trimethyl indium (TMIn), and ammonia (NH_3) as precursors, and hydrogen (H_2) and/or nitrogen (N_2) as the carrier gases. Triethyl gallium (TEGa), ethyldimethyl gallium (EDMGa),

triethyl indium (TEIn), ethyldimethyl indium (EDMIn) can also be used as group III precursors, while dimethylhydrazine ($H_2N_2(CH_3)_2$, 1,1 DMHy) is preferred as a N precursor. For this group of SQWs, a 2μm thick undoped bulk GaN was first grown on a 250Å thick GaN buffer layer. The growth temperature was 530°C and 1030°C respectively for the GaN buffer and bulk layer. After deposition of the GaN bulk layer, the growth temperature was lowered down to about 700°C to ~~800~~850°C for the deposition of the $In_xGa_{1-x}N$ barrier and the $In_yGa_{1-y}N$ well. After the deposition of the $In_xGa_{1-x}N$ barrier wherein x ranges from 0 to 0.10, and prior to the growth of $In_yGa_{1-y}N$ well, wherein y is greater than x, TMIn was flowed at a flow rate less than 100 μmol/min for a short time varying from 2 to 5 seconds with TMGa flow switched off.

5. Paragraph 16 (previously 17) is amended as follows:

According to the invention, it has been found that the photoluminescence from the first and second groups of SQWs are 488nm and ~~548nm~~ 520nm respectively at ~~the~~ room temperature. The luminescence from the first and the second group are in the blue and green regions respectively, which are suitable for the fabrication of blue and green LEDs.

6. Paragraph 25 (previously 26) is amended as follows:

FIG. 1 illustrates first embodiments of the InGaN/InGaN quantum well structure which can be used for the blue and green LEDs. Referring now to FIG. 1, ~~layer1~~layer 1 is the substrate which can be sapphire, silicon carbide (SiC), zinc oxide (ZnO) or other substrates. Layer 2 is the low-temperature buffer. Layer 3 is the undoped GaN or Si-doped GaN grown at around 1030°C, doped at a concentration of 2×10^{17} cm^{-3} to 9×10^{18} cm^{-3}. Layer 4 is the $In_xGa_{1-x}N$ barrier wherein x ranges from 0 to ~~0.001~~0.10, grown at a temperature from 700°C to ~~800~~850°C. After the growth of layer 4, TMIn and ammonia were flowed to form "seeds" for the growth of indium rich QDs at the same growth temperature of layer 4. Layer 5 is the $In_yGa_{1-y}N$ quantum well, wherein y is greater than x, grown at the same temperature of layer 4. Layer 6 is another $In_xGa_{1-x}N$ barrier grown at the same temperature of layer 4. Layer 7 is the GaN cap grown in the range of 800°C to 1100°C. The typical thickness for each layer is 200 μm to 500 μm for layer 1, 20 nm to 40 nm for layer 2, 1 μm to 4 μm for layer 3, 2 nm to 10 nm for layer 4, 2 nm to 4 nm for layer 5, 2 nm to 10 nm for layer 6, and 10 nm to 1000 nm for layer 7.

7. Paragraph 29 (previously 30) is amended as follows:

Referring now to FIG. 4, layer 1 is the substrate, which is preferably sapphire, SiC or ZnO; layer 2 is the low-temperature buffer grown at about 450°C to 600°C; layer 3 is the undoped GaN or Si-doped GaN, grown at around 1030°C; layer 4 is a GaN or InGaN grown at the same temperature as the barrier and well; layer 5 is a $In_xGa_{1-x}N$ barrier, wherein x ranges from 0.01 to 0.1 grown at about 700°C to ~~800~~850°C; after the growth of layer 5, TMIn and ammonia were flowed to form "seeds" for the growth of indium rich QDs, with indium content more than 0.20;~~,~~ layer 6 is the $In_yGa_{1-y}N$ quantum well where y is greater than x; layer 7 is another $In_xGa_{1-x}N$ barrier typically similar to layer 5; layer 8 is the GaN cap grown at temperatures in the range of between 800°C and 1030°C.

The amendments **1-3** are merely editorial.

In the amendment **4**, the amendment of the range of growth temperature of layer 4 from 800 to 850 °C is supported by the original claim 1 of the parent application and also conforms the specification to the present claims.

The deletion of "the" in amendment **5** is merely editorial. Support for the change of wavelength from 548 to 520 nm is supported by Figure 5, which shows a valley in the luminescence spectrum between the two peaks of emission at 520 nm, not at 548 nm.

In the amendment **6**, the amendment to recite "layer 1" instead of "layer1" is merely editorial. The amendment of the range of x from 0.001 to 0.10 is supported by the original claim 1 of the parent application 09/963,616. The Examiner might also note that the "barrier layer" is layer 4 in Figure 1. The amendment of the range of growth temperature of layer 4 from 800 to 850 °C is supported by the original claim 1 of the parent application and also conforms the specification to the present claims.

In the amendment **7**, the amendment of the growth temperature of the layer 5 from 800 to 850 °C is supported by the original claim 5 of the parent application and also conforms the specification to the present claims. The insertion of the indium content of the layer incorporates the Examiner's Amendment to the specification indicated by the Notice of Allowability and is supported by the original claim 1 of the parent application.

Thus, none of the changes to the specification add new matter nor do they raise any new issues. Accordingly, entry thereof is requested.

Drawings

All lines, numbers and letters on Figure 3 are uniform, clean and well defined. The character "p" in "cap" in Figures 1 and 4 is made more clear.

Claims

A clean set of claims as allowed, incorporating the Examiner's Amendment of June 29, 2004, is attached for the convenience of the publication division.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. §§ 1.16 or 1.17; particularly, extension of time fees.

Respectfully submitted,

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Attachment(s): Clean set of claims
Substitute Specification
Three (3) replacement sheets of drawings
(Figs. 1, 3 and 4)

AMENDMENTS TO THE DRAWINGS

Attached hereto is one (1) sheet of corrected formal drawings that comply with the provisions of 37 C.F.R. § 1.84. The corrected formal drawings incorporate the following drawing changes:

Uniform, clean and well defined lines, numbers, letters on Figure 3.

The character "p" in "cap" in Figures 1 and 4 is made more clear.

It is respectfully requested that the corrected formal drawings be approved and made a part of the record of the above-identified application.